

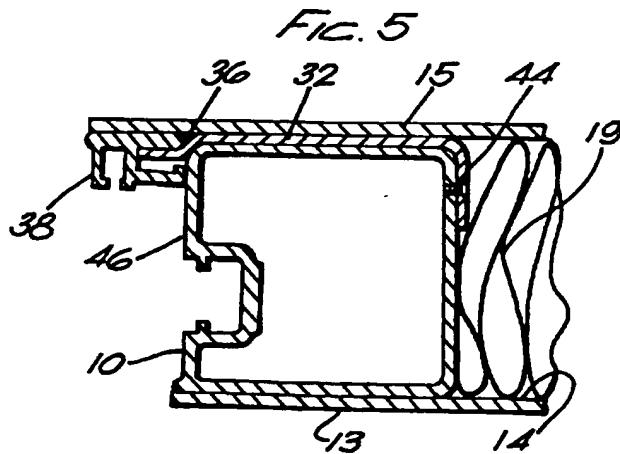
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(54) Abstract Title  
A door with a reinforced frame

(57) The present invention relates to a door comprising a support frame (10), face panels (13,15), and a reinforcing section (32) sandwiched between at least part of the frame and a face panel. The reinforcing section is preferably a steel plate and has stiffening return portion extending at least part way across the thickness of the door. The door may be fabricated from UPVC or glass reinforced polyester, with the support frame comprising extruded or pultruded lengths joined together in a substantially rectangular form. The face panels provide front and back faces for the door. The reinforcing section may have a kink provided therein to allow a gasket holder (38) to be attached thereto. Alternatively, the gasket holder may be integral with the support frame or snap fitted onto a clip provided on the support frame.



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FIG. 1

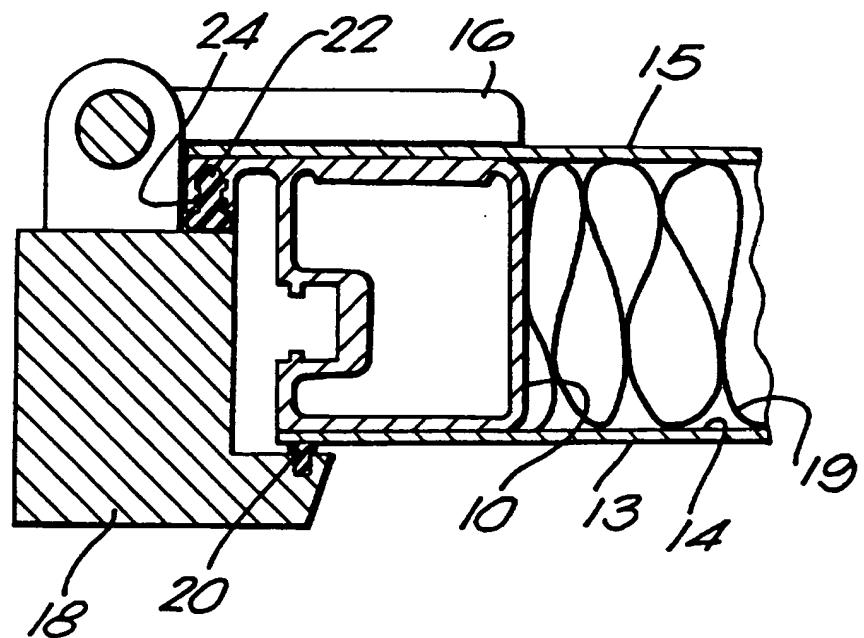
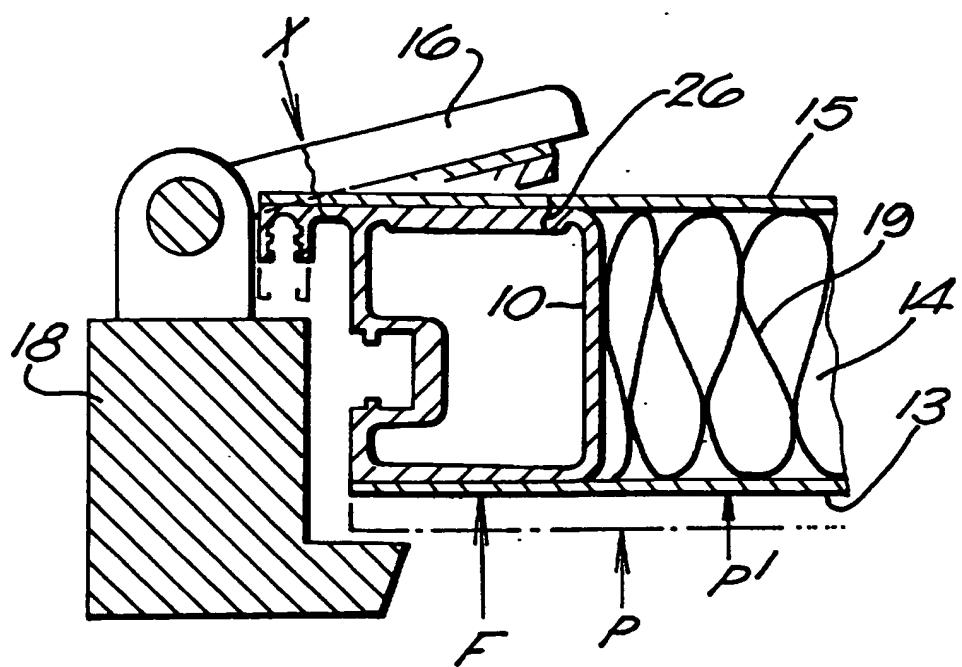


FIG. 2



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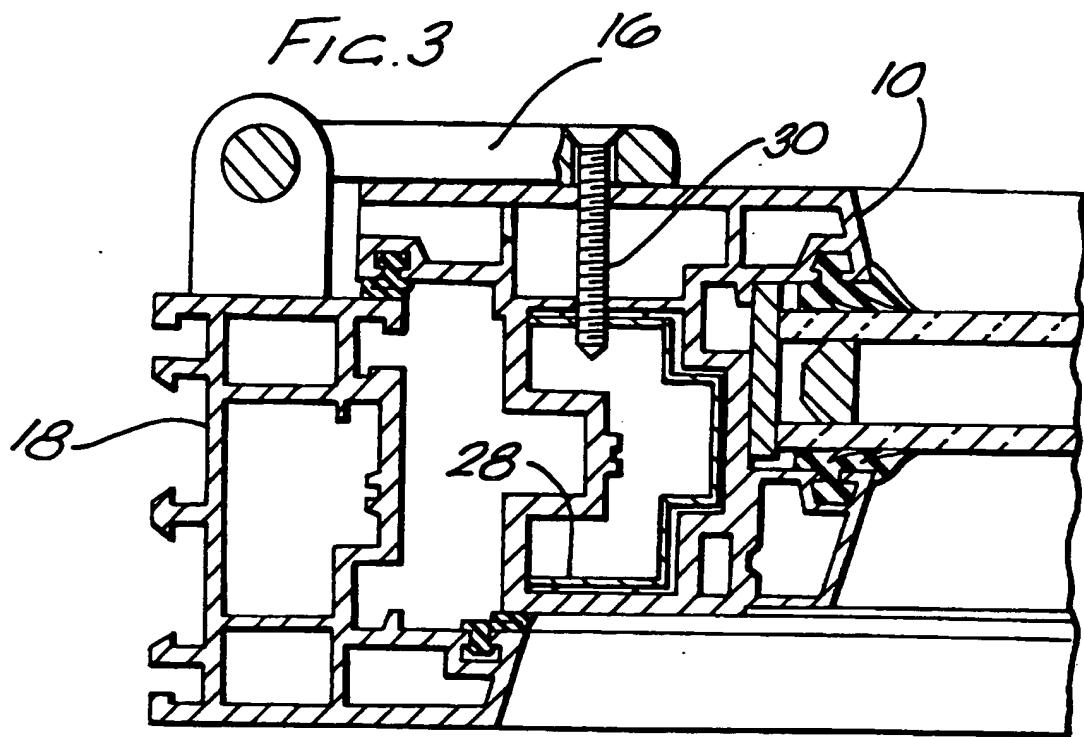
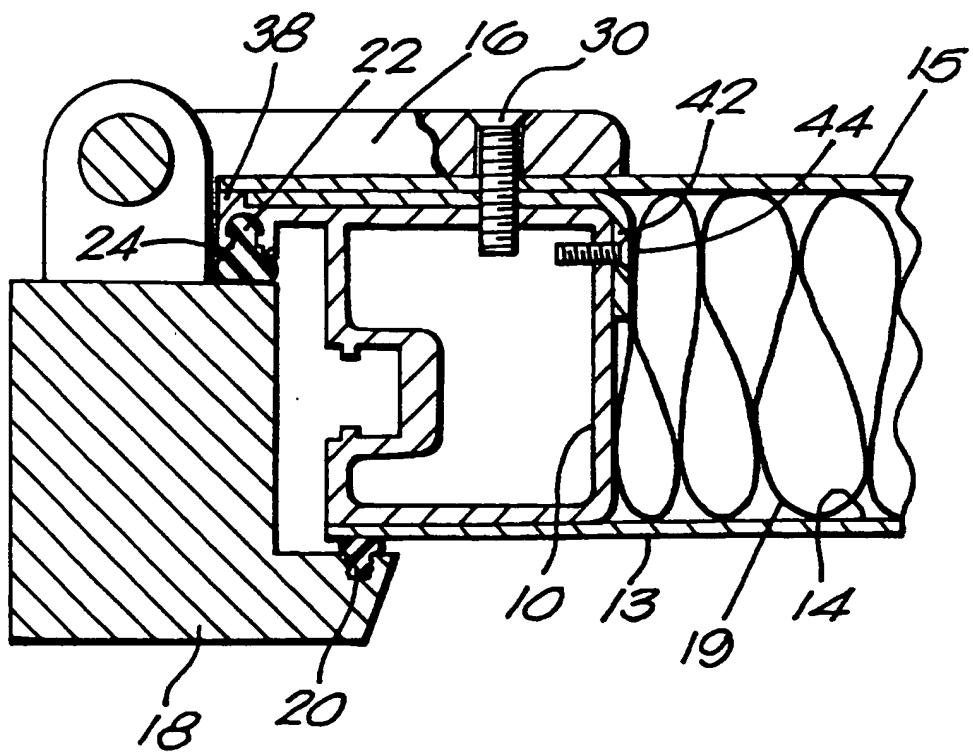


FIG. 6



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FIG. 4

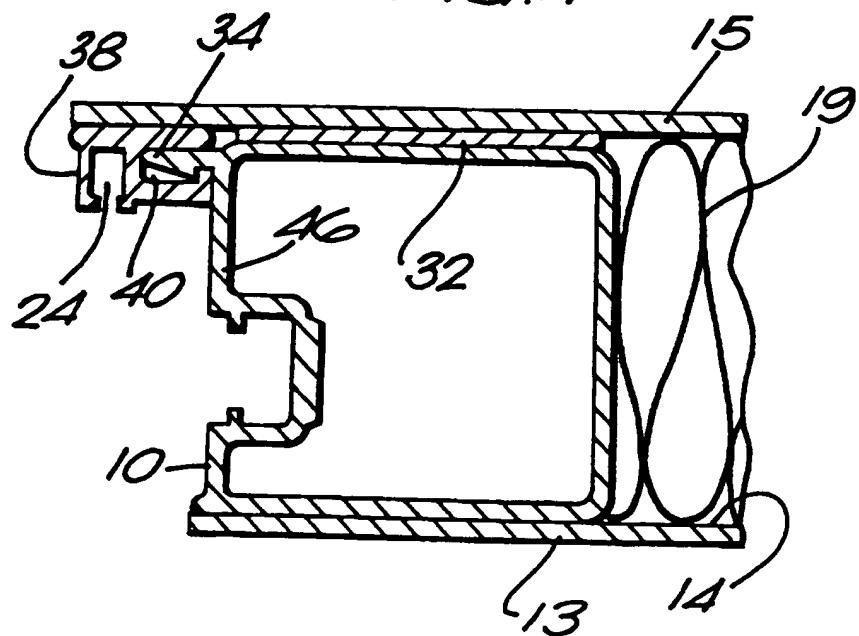
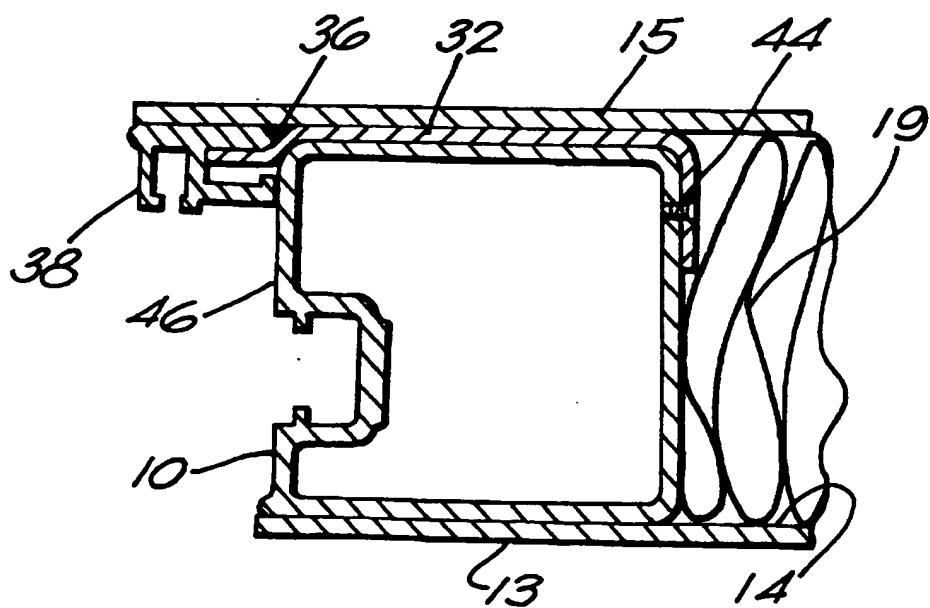


FIG. 5



A DOOR

The present invention relates to doors.

5        Composite doors comprising a support frame fabricated from material extruded as elongate lengths of regular cross-section and composition and one-piece face panels bonded to the support frame to cover the full lateral extent of the support and to leave exposed the edges of the support frame defining the edges of the door are known. See, for example, U.K. patent 2183706, filed 7th December, 1985, which discusses prior art  
10      wooden doors and UPVC doors. The support frame of the door is disclosed as being extruded UPVC material, which is normally reinforced internally with steel, or extruded aluminium which does not require reinforcement.

Doors and frames, similar to that disclosed in U.K. patent 2183706, having a  
15      front mounted hinge attached thereto by known means are shown in Figures 1 to 3  
herein.

With reference to Figure 1, the door comprises a rectangular support frame 10 of extruded UPVC sections. Molded face panels 13,15 are bonded to the support frame 10 and a cavity 14 between the panels 13,15 and the support frame 10 is filled with a foam plastics material 19. The door is attached by a hinge 16 to a frame 18 and gaskets 20 mounted in a rebate of the frame 18 abut the door to provide a weather seal. Additional gasket seals 22 are received in gasket grooves 24 formed in the extruded UPVC section and abut the frame 18 when the door is closed. The hinge 16 may be attached to the  
25      door by known means, for example by screws extending into the support frame 10 or by an adhesive.

Figure 2 shows a door of the type shown in figure 1 which has been subjected to a forced burst entry test, in which a force F has been applied perpendicular to the inner  
30      face panel 13 of the door adjacent the hinge 16 to force the door away from the frame 18, from its normal position P, shown in phantom, to its displaced position P'. A fracture 26 has formed in the outer face panel 15 of the door, thus causing a failure in which the hinge 16 with the outer face panel 15 and part of the support frame 10, in the

region of the hinge 16, breaks away from the support frame 10. This type of failure presents a major problem for this type of door.

Figure 3 shows a UPVC window/door having a steel reinforcing section 28 inserted within the UPVC section. The reinforcing section 28 provides a solution to the above problem by allowing a screw 30 to be attached through the hinge 16, the panel 12 and the support frame 10 into the steel reinforcing section 28, such that the burst strength of the door may be substantially improved. If the reinforcing section 28 is sufficiently strong, then a forced burst entry test would result in a fracture forming at point X in the hinge 16, as indicated in Figure 2, rather than in the door as previously described. This could ultimately result in the burst strength of a door being limited by the strength of the hinge, and not the strength of the door.

Unfortunately, a UPVC section having a steel reinforcing section 28 inserted therein is somewhat more expensive to manufacture than a UPVC section, and also the steel reinforcing section 28 can cause problems later in the door manufacturing process: The steel reinforcing section 28 extends the full length of the UPVC section, and therefore is present around the whole of the door. Composite doors are designed to be mountable in a left or a right hand opening. Therefore, handles or locks could be mounted on either side of the door. Machining of the door is required to fit locks and handles. The reinforcing section 28 within the UPVC section causes difficulty with fitting the handle and door accurately to the door.

In the light of the foregoing, the present invention aims to provide a door of the general type disclosed in U.K. patent 2183706, but which has an improved burst strength, and which is both cheap and easy to manufacture.

According to the present invention, there is provided a door of the general type disclosed in U.K. patent 2183706 comprising a support frame and face panels, wherein a reinforcing section is sandwiched between at least part of the support frame and a face panel. The reinforcing sheet is preferably sandwiched at a door furniture attachment point of the door, such as a hinge, and may extend the full length or width of the door.

The reinforcing section is preferably a steel sheet or plate and may be adhered or bonded to the support frame or face panel. Aluminium or other stiff materials may also be used. Carbon fibre may be an option. The reinforcing section will usually be arranged adjacent the hinge or generally in the hinge portion of the door. However, the 5 reinforcing section may be arranged in other positions on the door to provide additional strength to the door where required, for example around the handles, locks or other door furniture.

The reinforcing section preferably has a return extending at least part way 10 through the thickness of the door. The return provides substantial torque stiffness to the reinforcing section. By attaching the return to the support frame or door edge, for example, the support frame or door edge will be substantially stiffened and/or strengthened. Adhesive or at least one screw may be used to attach the return to the support frame, thus also providing an increased shear resistance between the return and 15 the support frame.

The support frame and reinforcing section may be fabricated from elongate lengths, with the reinforcing section being attached to an external surface of the support frame prior to the face panels being attached to the support frame.

20 A gasket holder may be formed integrally with the support frame, or separate therefrom and attached to a free edge of one of the face panels. This may be achieved by specifically shaping the reinforcing section or by forming an attachment means on the support frame, and attaching the gasket holder thereto. For example, the reinforcing 25 section may define a groove into which a part of a separate gasket holder is inserted. Alternatively, a gasket holder locator may be provided on a door edge face of the support frame, the locator comprising an elongate clip, wherein the gasket holder has a corresponding slot for snapping thereon.

30 Having a gasket holder which is separate from the support frame results in the need to manufacture a separate component. However, this separate component can be manufactured in any number of different colours to match the face panel to be used on the door. Hence, an unsightly door edge can be avoided because the gasket holder

colour can be matched to the face panel colour. Indeed, a door according to the present invention preferably has a gasket holder which has substantially the same colour as its adjacent face panel.

5 The gasket holder is preferably formed from plastics material, more preferably as a thermoplastic extrusion. The gasket holder may be co-extruded with a gasket of softer material.

Another advantage which arises from producing a separate gasket holder is that  
10 10 a number of different sized gasket holders can be manufactured. This allows a multitude of door frames having different shapes and sizes to be catered for without the need to produce complete support frames incorporating different sized gasket holders.

15 GRP (Glass reinforced polyester) or another high stiffness/high strength composite material may be provided for the reinforcing section. Such a section may be produced by pultrusion, and could also be co-pultruded with an elongate UPVC length for use in fabricating the support frame. This may result in a significant saving in both materials and manufacturing time.

20 Preferably the face panels are fabricated from glass reinforced polyester. Other appropriate materials can, of course, alternatively be used. The face panels may be attached to the support frame by epoxy resin adhesive, chemical welding or any other appropriate means.

25 Each face of the door is preferably formed as a single face panel. Unsightly joins can thereby be avoided.

If appropriate, the face panels may be shaped or contoured.

30 Preferably the support frame has a constant cross-section throughout. If necessary, however, lengths having different cross-sections may be used for different parts of the support frame. In any event, the lengths preferably have a cross-section which is substantially rectangular. This makes for easy pultrusion.

The support frame and the face panels preferably define a cavity filled with insulating material.

5 Specific embodiments of the present invention are now described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic section through a prior art door and frame similar to that disclosed in U.K. patent 2183706, having an externally mounted hinge;

10

Figure 2 is a schematic section through the prior art door and frame of Figure 1, after a forced burst entry test;

15 Figure 3 is a schematic section through a door and frame showing a reinforcing section within the support frame as known in the art;

Figure 4 is a schematic section through part of a door according to a first embodiment of the present invention;

20 Figure 5 is a schematic section through part of a door according to a second embodiment of the present invention; and

Figure 6 is a schematic section through a door and frame according to a third embodiment of the present invention having a face mounted hinge.

25

A door according to the present invention is preferably fabricated from a plurality of elongate lengths defining a substantially rectangular support frame 10 for supporting front and rear face panels 13,15. The elongate lengths, which are joined together at right angles using known techniques such as 90° sections, are preferably 30 formed by pultruding glass reinforced polyester (GRP). With reference to Figure 4 of the drawings, the face panels 13,15, which are preferably vacuum formed or pressed into shape, and are also preferably made of GRP, are attached to the support frame 10 using epoxy resin adhesive or chemical welding, via an intermediate reinforcing section

32 sandwiched between the support frame 10 and the face panel 15. A cavity 14 formed between the face panels 13,15 and the rectangular support frame 10 is filled with insulating material 19.

5        As can be seen in Figure 4, the outer face panel 15 extends past the support frame 10 and carries a gasket holder 38 defining a recess 24 for receiving a gasket (not shown). The gasket holder 38 may be formed from extruded plastics material, such as UPVC or GRP. As a result, elongate lengths of the UPVC or GRP can be manufactured in a plurality of different colours in line with the colours chosen for the outer face panel  
10 15. The amount of space needed to store these elongate lengths of UPVC or GRP is considerably less than would be required to store corresponding amounts of differently coloured complete support frames 10.

15        The gasket holder 38 is preferably secured to the outer face panel 15 adjacent its free edge using epoxy resin adhesive, chemical bonding, or any other appropriate means. Figure 4 shows a further connection provided by a clip 34 extending from a door edge face 46 of the support frame 10 engaging within a slot 40 formed in the gasket holder 38. If the colours of the face panel 15 and the gasket holder 38 are essentially the same, the join between the two will be indiscernible.

20        The reinforcing section 32 is preferably a sheet or plate of steel. The sheet of steel may be perforated to allow through bonding of the face panel 15 with the support frame 10.

25        Referring now to Figure 5, the reinforcing section 32 has a return 42, which greatly increases the torque stiffness of the reinforcing section 32. The return 42 extends at least part-way through the thickness of the door and overlaps at least part of the cavity 14 facing surface of the support frame 10. The return 42 is adhered to the support frame 10 which, in conjunction with at least one screw 44, provides a shear  
30 35 resistant joint. The joint is preferably formed prior to attaching the face panels to the door, so that the cavity facing edges of the support frame can be accessed. The at least one screw 44 and the adhesive, although advantageous in providing the shear resistance, are not essential.

At the opposite edge of the reinforcing section 32 to that of the return 42, a kink is formed in the reinforcing sheet 32, thereby forming a groove 36 between the face panel 15 and the reinforcing section 32. The groove 36 extends outwardly from the 5 door edge surface 46 of the support frame 10. A gasket holder 38 is engaged within the groove, thus being secured in position relative to the free edge of the face panel 15. The kink further increases the stiffness of the reinforcing section 32. Further, by extending the reinforcing section 32 into the gasket holder 38, added support is provided to the hinge, giving the door an improved forced entry burst strength.

10

Referring now to Figure 6, a third embodiment of the present invention, shown in association with a frame 18 and a hinge 16, comprises a reinforcing section 32 much the same as that described for the embodiment of Figure 5. However, the gasket holder 38 is shown to be an integral part of the support frame 10, and the kink in the 15 reinforcement section 32 is not present. The hinge 16 is attached to the outer face panel 15 of the door by at least one screw 30 extending through the hinge 16, the outer face panel 15, the reinforcing section 32 and the support frame 10. Preferably, the hinge 16 is also adhered or bonded to the face panel 15 to provide a more secure attachment.

20

In each embodiment of the present invention, the reinforcing section 32 may extend over the full length of the door, or just around those parts of the door requiring reinforcement. The reinforcing section 32 may also extend across the width of the door. The return 42 provided on the reinforcing section 32 may also be adapted to be of a variable depth along its length, preferably being deeper adjacent positions requiring 25 substantial reinforcement, e.g. the hinge portions of the door, and shorter elsewhere.

In the prior art arrangements of Figures 1 to 3, forced burst entry testing causes the door to fail since a fracture forms in the door. In a door comprising the reinforcing section 32 of the present invention, the force caused at the hinge attachment point, due 30 to a force  $F$  imposed during forced burst entry testing, will be distributed over a larger area of the door and, accordingly, the door should be able to withstand a greater burst force. Further, a steel reinforcing plate will increase the screw pull out resistance of the door.

The door production is also simplified since the reinforcement is applied externally to the support frame. A door comprising a support frame and face panels is designed so as to be capable of being hung with either a left or a right hand opening.

5 The reinforcing section can therefore be selectively applied in those areas requiring reinforcement, i.e. the hinge portion, thus leaving the other areas requiring machining, e.g. for fitting locks and the like, free of reinforcement. The reinforcing section could also be pre-formed with appropriate openings, e.g. for screws or keyholes such that locks or handles may be mounted to the door without the requirement to machine the

10 reinforcing section.

It will of course be understood that the present invention has been described above purely by way of example, and that modifications of detail can be made within the scope of the invention.

Claims.

1. A door comprising a support frame and face panels, wherein a reinforcing section is sandwiched between at least part of the support frame and a face panel.
- 5 2. A door according to claim 1, wherein the reinforcing section is sandwiched at a door furniture attachment point of the door.
3. A door according to claim 1 or 2, wherein the reinforcing section is sandwiched adjacent a hinge portion of the door.
4. A door according to any preceding claim, wherein the reinforcing section 10 extends the full length of the door.
5. A door according to any preceding claim, wherein the reinforcing section is a steel sheet or plate.
6. A door according to any preceding claim, wherein the reinforcing section is attached to the support frame.
- 15 7. A door according to any preceding claim, wherein the reinforcing section has a return extending at least part way through the thickness of the door.
8. A door according to claim 7, wherein the return is attached to the support frame by a screw.
9. A door according to claim 7 or 8, wherein the return is adhered to the support 20 frame.
10. A door according to any preceding claim, wherein the support frame is fabricated from elongate lengths of equal section.
11. A door according to any preceding claim, wherein the reinforcing section is attached to the support frame prior to attaching the face panels to the support frame.
- 25 12. A door according to any preceding claim, wherein a gasket holder is held adjacent to a free edge of one of the face panels by the reinforcing section.

13. A door according to claim 12, wherein the reinforcement section has a kink forming a groove between the face panel and the reinforcement section, and the gasket holder engages within the groove.
14. A door according to any of claims 1 to 11, wherein a gasket holder is held adjacent to a free edge of one of the face panel by an attachment means on the support frame.
15. A door according to claim 14, wherein the attachment means comprises a clip, and the gasket holder comprises a corresponding slot for receiving the clip.
16. A door according to any preceding claim, comprising a gasket holder which has substantially the same colour as its adjacent face panel.
17. A door according to any of claims 12 to 16, wherein the gasket holder is formed by thermoplastic extrusion.
18. A door according to claim 17, wherein the gasket holder is co-extruded with a gasket of softer material.
19. A door according to any preceding claim, wherein the face panels are fabricated from glass reinforced polyester.
20. A door according to any preceding claim, wherein the face panels are pultruded.
21. A door according to any preceding claim, wherein each face of the door is formed from a single face panel.
22. A door according to any preceding claim, wherein the support frame and the face panels define a cavity.
23. A door according to claim 21, wherein the cavity is filled with insulating material.
24. A door according to any preceding claim, wherein the support frame is made of UPVC.

25. A door according to any of claims 1 to 23, wherein the support frame is made of glass reinforced polyester.
26. A door according to any preceding claim, wherein the support frame is pultruded.
- 5 27. A door substantially as hereinbefore described with reference to any of Figures 4 to 6.



Application No: GB 9814728.3  
Claims searched: 1 - 27

Examiner: P. Gardiner  
Date of search: 21 April 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): E1J: JGD, JGE, JGL, JGS

Int Cl (Ed.6): E06B

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB 2258488 A	POST OFFICE COUNTERS Ltd (e.g. Fig.1)	X:1-6,10,22 Y:14-17
X, Y	GB 2036838 A	COLEMAN & DRAKE (e.g. Fig.1)	X:1-6,10,21,22 Y:14-17
X, Y	FR 2624160 A1	JEAN HUIT & FILS S.A. (e.g. Fig.1)	X:1-7,10,11,21-23 Y:14-17
Y	DE 3143144 A1	WINFRIED ZIEGER (e.g. Fig.3)	Y:14-17

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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